

PE500x ASSP family

Capacitive Sensor Signal Conditioning ICs



PE5001

Capacitive Array Column Driver

PE5002

Capacitive Array Row Signal Conditioner

PE5003

Capacitive Sensor Array Controller

Features

- fast data acquisition time for min. 10000 sensor cells (or less)
- low power consumption (10 μ A per sensor)
- 10 bit signal resolution
- small form factor due to micro bump die attach
- scalable sensor array field size due to the possibility to cascade column and row ICs

Applications

- palm/finger print micro-sensor array
- high resolution touch screens
- permittivity liquid analysis and flow monitoring (dielectric constant difference)
- biomedical artificial extremities sensors
- artificial hand with touch strength sensitivity
- laboratory bio-chemical cell growth monitoring

A typical sensor system consists of a capacitive sensor field and the Application Specific Standard Products (ASSP) PE5001, PE5002, PE5003.

The system allows for a very high number of sensors due to the scalability of the signal conditioning ICs. A pair of PE5001 and PE5002 can operate as a sensor signal conditioner for up to 10000 capacitive sensors at once. Each of the sensors delivers a resolution of up to 10 bits which results in 10 Million distinguishable conditional phases in the sensing matrix. The system delivers the full set of data within just 25 milliseconds to a host processor. Power consumption in full speed mode is less than 100mA for the whole system. It can be decreased by reducing the data acquisition speed.

The resolution can be as high as 800dpi for micro-sensors. By adding several column drivers (PE5001) each additional IC adds another 10000 sensors. By adding several row sensor signal conditioners (PE5002) each additional IC adds also 10000 sensors. A matrix of 8 PE5001 and 8 PE5002 can have as many as 800x800 capacitive sensors with 10 bit resolution each. It can provide the full set of data in less than half a second.

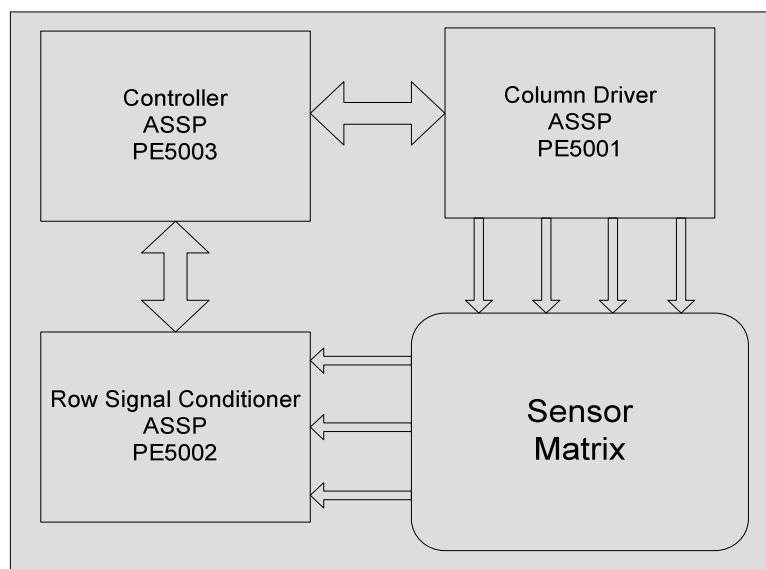


Figure 1: Principle sensor system building blocks

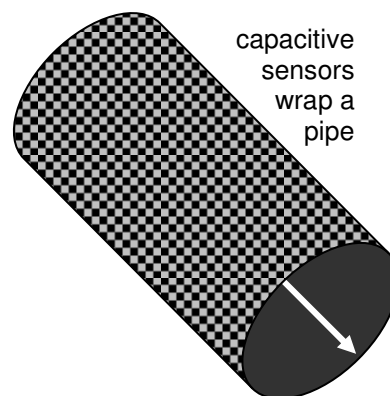
Typical applications for the PE500x family of Integrated Circuits

Artificial hand

Every year 200 people just in the UK lose their hands (Source : BBC). For an artificial hand mechanical motion control is just one side of the issues that have to be solved. The other side is sensitivity of pressure. The aim is to create a hand with the sort of functionality a human hand has but also with a sense of touch. The PE - ASSP system provides the electronics for artificial touch sensitivity to be applied to such hand prostheses and to patients with loss of sensory nerve function. Getting the information about the grip strength of the artificial hand is very important. The sensor system acquires the information and sends a complex data stream to the host processor. Each capacitive sensor signal has a resolution of up to 10 bit after signal conditioning. The data can be used to adjust the motion control accordingly.

Fluid concentration and flow monitoring

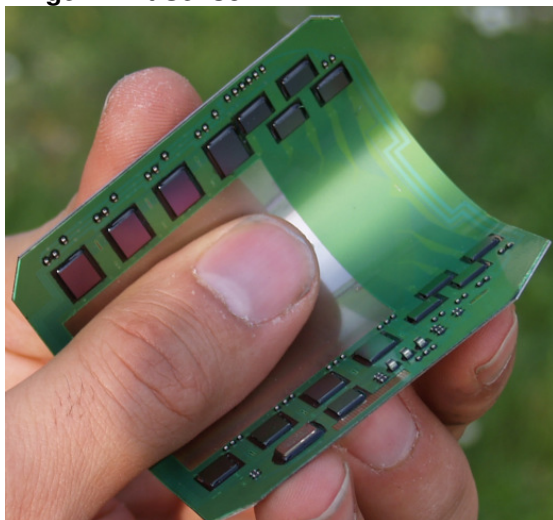
Every fluid has a specific dielectric constant. This parameter can be used to control the presence or the flow of a liquid by using the capacitive sensor array signal conditioning system of PE. The change of capacitance in every single sensor indicates the type of material and the direction of the flow of the liquid as well as the speed.



Palm Print Sensor

The sensor system's resolution can be in the range of 500 to 800 ppi (pixels per inch) depending on the sensor pixel size. This allows the system to scan a whole hand producing a picture size of up to 4000*2500 pixels. The enormous implementation of 10 million sensor cells forces an adaptable and cascade-able system design. Similar to today's flat panel displays, multiple integrated circuits located at the rows and columns of the array are used to serve the whole sensor array. One IC is able to handle 100 outputs (column driver) or 100 inputs (row signal conditioner). This is a convenient upper limit and a reasonable size for chip size and assembly. Only one PE5003 controller IC is required as the system master and it manages the process of data acquisition and streaming to the host controller.

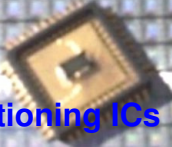
Finger Print Sensor



A flexible sensor on polymer substrate can be used to scan the pattern of one finger with very high resolution and accuracy. Today's recognition systems usually use fixed substrates prohibiting scanning of the finger's sides. This can only be achieved by a rolling motion of the finger setting limits on accuracy and achievable optical resolution. The flexible nature of this sensor system gives the chance to get premium results combined with easier handling and use. The typical scanning time for a rolled finger print is around 20 seconds. By recording the whole print at once, this time maybe reduced to one second.

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